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DIRECTORATE OF PLANT PROTECTION, QUARANTINE & STORAGE
MINISTRY OF FOOD & AGRICULTURE, GOVERNMENT OF INDIA

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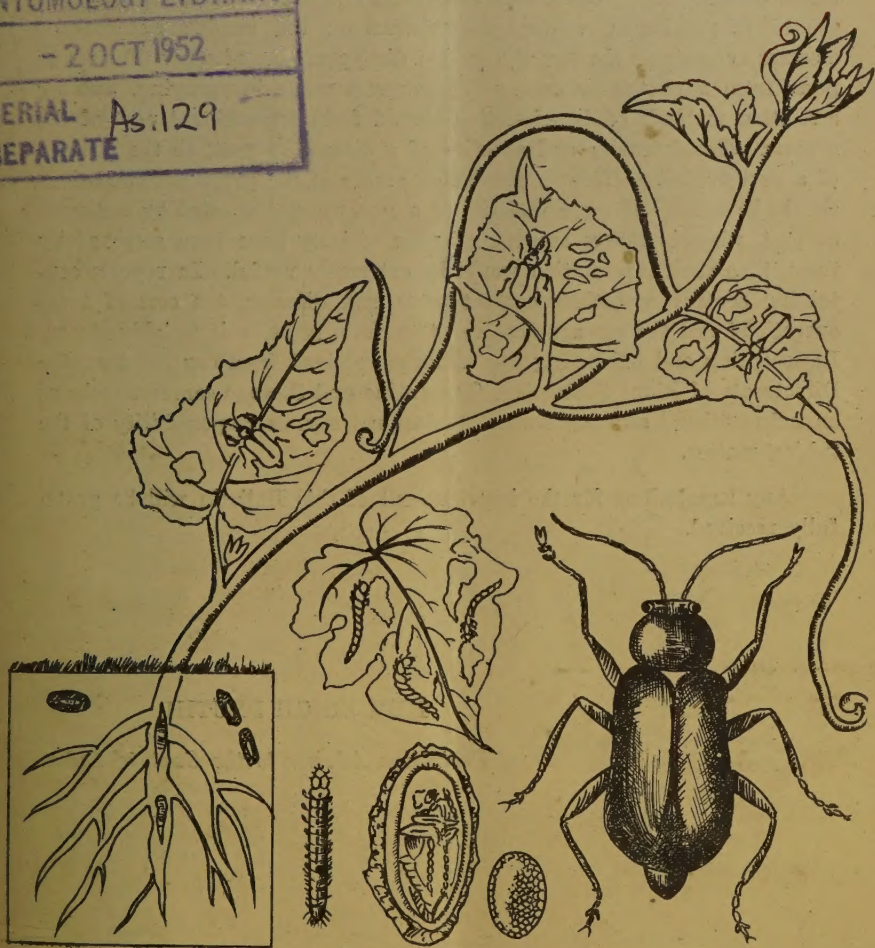

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NOTE

Plant Protection Bulletin is intended to keep all Plant Protection Workers in India informed of the progress of control work on plant pests and diseases in different parts of the country and of the advances and developments in Plant Protection work in other parts of the world. Suitable articles, reports, notes, observations and comments received from workers all over India will be published in the Bulletin. The notes from correspondents may also be in the form of suggestions, queries and opinions, even tentative, offered for discussion or consideration. The reports should in particular, contain information on the sudden outbreak of diseases or pests or the equally sudden disappearance of other diseases or pests from a particular area. The progress made in spraying, dusting and other methods of disinfestation should form a prominent part of the reports. The intensity and severity of a disease or pest, or the absence of a pest or disease from a particular area and the prevalent conditions should be noted. If some varieties of a crop are not affected by a disease or pest, whereas others occurring in the vicinity have been attacked by them, then such information would be extremely useful. In reports containing control operations against pests and diseases, the cost of these operations and the savings obtained therefrom must be invariably stated. In accepting and publishing any material received from contributors, the Directorate of Plant Protection, Quarantine and Storage serves merely as an informational clearing house. It does not assume responsibility of the subject-matter.

Any suggestions for the improvement of this Bulletin will be gratefully received.

HEM SINGH PRUTHI,

Plant Protection Adviser to the Govt. of India.

NOTES ON INSECT PESTS OF CROPS OCCURRING IN MYSORE STATE DURING 1949-50 AND 1950-51.

(*The Division of Entomology, Department of Agriculture in Mysore, Bangalore*)

1. Paddy

The Paddy Stem Borer (*Schoenobius incertellus Walker*) and the Rice Case-worm (*Nymphula depunctalis Guenee*) are two major pests, which occur regularly every year in February-April and September-November over almost the entire State. The incidence of the Stem Borer is not high, but it occurs along with *Piricularia* and the aggregate loss due to them is some times heavy in certain localities. The Rice Case-worm occasionally causes appreciable damage at the early stage of the crop. Besides the usual control measures viz., collection of eggmasses and dead-hearts, light traps, etc., steeping of seedlings in a solution of DDT (*Guesarol*-550) at the rate of 1 lb. in 16 gallons of water before transplanting is being advocated against the Paddy Stem Borer. *Tetrastichus schoenobii* Ferriere. *Phanurus beneficiens* Zehntner and *Trichogramma japonicum* Ashmead (Chalcididae : Hymenoptera) are three natural egg-parasites, which play an important part in the control of the pest in that they parasitise as much as 62 per cent of the host egg-masses during October-November. Kerosene oil-film treatment against the Paddy case-worm still holds good and is universally practised throughout the State; Gammexane D.025 diluted with 6 parts of dry wood ash is also effective as a dust in fair weather.

The Rice Grasshopper (*Hieroglyphus banian* Fabricius) is also a major pest of paddy, but is highly localised in certain areas in Shimoga, Mandya, Chikmagalur and Bangalore Districts. Though it is present every year, large-scale outbreaks occur in irregular cycles. In June-November 1949, the Rice grasshopper appeared in great numbers in an extensive area (12,700 acres) in Anavathi, Shimoga District, and to a lesser extent in certain localities in the other Districts ; it was effectively controlled by large scale field dusting with Hexyclan (5 per cent and 7½ per cent) and Gammexane D. 025 1 part in 4 parts of dry wood ash for nymphs and 1 : 1 for adult hoppers.

The Green Beetle of paddy (*Leptispa pygmaea Baly*), normally a minor pest, assumed the status of a major pest in an area of 8,612 acres in 1946. It is confined to Malnad districts of Shimoga, Chickmagalur and Hassan, and is now on the decline. By large-scale kerosene oil-film treatment or dusting with 5 per cent Gammexane D.025 (diluent dry wood ash) in fair weather in *Makki* (dry) lands, the pest was effectively controlled in 8,364 acres of the infested area. Used Transformer Acid oil, a waste product obtained from the Mysore Electrical Department, was found to be a good substitute for kerosene oil and was utilised for this purpose when there was a scarcity of kerosene oil.

The minor pests of paddy—*Spodoptera mauritia* Boisduval, *Pachydiplosis oryzae* Mani, *Thrips oryzae* Williams, *Cnaphalocrocis medinalis* Guenee, *Parnara mathias* Fabricius and *Ripersia oryzae* Green occurred sporadically at irregular intervals and sometimes caused considerable damage in certain localities.

2 Ragi (*Eleusine coracana*)

Ragi is a millet of considerable importance in Mysore, and until recently it was considered to be practically free from serious pests. The Ragi stem Borer, (*Sesamia inferens* Walker) sometimes occurred in Kar (irrigated) Ragi; but since 1945 with the extensive cultivation of Kar Ragi as part of the Grow More Food Compaign, *Sesamia* has assumed the status of an economic insect of considerable importance. Now it occurs extensively and sometimes causes severe damage in certain localities. It is present all round the year, and infests Ragi and to a lesser extent sugarcane, wheat and early winter paddy. Light earthing up of young seedlings and removal of dead-hearts are commonly practised as preventive measures against this pest. Recently steeping of seedling in a solution of DDT (Guesarol 550) at the rate of 1 lb. in 16 gallons of water just before transplanting has been found to be effective. *Winthemia semiberbis* Bezzi (a Tachinid fly) and *Microbracon chinensis* Szepligeti (a Braconid wasp) are two important natural larval parasites, which occur in appreciable numbers during March-July and parasitise as much as 20.7 per cent of the stem borer larvae. Laboratory and field trials have shown that *Microbracon hebetor* Say also successfully parasitises the stem borer larvae, and attempts are being made for the mass-production of this useful parasite in the laboratory on a suitable alternate host, *Corcyra cephalonica* Stainton, for large scale bulk releases in the fields. The Ragi Cutworm (*Euxoa segetum* Schiffer-muller) an occasional serious pest in the Ragi nurseries in Chitaldrug and Mysore Districts, appeared in large numbers on young Ragi crop in an area of 200 acres in Gundlupet Taluk, Mysore District, during August-September 1950. Besides Ragi, it attacked seedlings of cotton, tobacco, chillies, etc. Sodium silicofluoride bait gave very satisfactory results and was employed on a large-scale for the control of this pest. (1 lb. in 8 seers of Rice bran and 2 lb. of Jaggery with water to moisten was the formulation and 10 seers of bait material were required per acre.)

In 1949, the *Ear Webbing caterpillar* (*Stenachroia elongella* Hampson) was noticed for the first time damaging Ragi ears in Mandya District. This is a common pest of jola (Jowar) ears (*Andropogon sorghum*) and has now taken to Ragi ear also. In 1950, the Jola crop completely failed for want of rains in Mysore District and Ragi was extensively cultivated in its place. The webbing caterpillar appeared as usual during September-November, and, in the absence of Jola, infested Ragi ears both in the field and stacks, in an area of 450 acres thus becoming a serious problem to the cultivators, particularly in the latter case. An effective control of the pest in the field was easily obtained by dusting with Gammexane D.025 (1 in 4 parts of dry wood ash) or Hexyclan (5 per cent and 7 per cent). The same treatment was very difficult to follow

against infestation of stacks, but there was no alternative and this was advised to prevent damage being done to the grain; but thorough sun-drying followed by early thrashing, which were more practicable, were also advocated; by adopting these measures the pest was brought under effective control. Fumigation of stacks with "Killoptera" a mixture of Ethylene dichloride + Carbon tetrachloride (3 : 1)—I.C.I. product—no doubt gave a high mortality (99 per cent) of the webbing caterpillar, but it could not be recommended as a general field practice in view of the high cost of the chemical, difficulty in procuring suitable equipment *e.g.*, tarpaulins, etc., and the probable risk involved in the use of the chemical in large quantities in the open fields.

Dichocrocis punctiferalis Guenee, a common borer pest of castor pods, has recently been found damaging Ragi ears under cover of a web.

In addition, three new webbing caterpillars (unidentified) have also been observed on Ragi ears in Mysore and Mandya Districts, but they are of minor importance.

Diacrisia obliqua Walker and *Colemania sphenarioides* Bolivar were noted on the Ragi crop but the damage by them was slight.

The Red headed hairy caterpillar (*Amsacta albistriga* Walker) a serious cyclic pest of Ragi, cereals and pulses has not occurred since 1937.

3. Jola [Jowar] (*Andropogon sorghum*)

The Deccan wingless Grasshopper (*Colemania sphenarioides* Bolivar) is a very important major pest of Jola, but occurs in regular cycles at an interval of about 10 years each, and is confined to Chitaldrug district and certain parts of Shimoga District. The present cycle, which commenced in 1940, has now practically declined. Sodium silicofluoride bait (1 lb. in 8 seers of Rice bran with 1-2 lbs. jaggery) and dusting with Gammexane D.025 (1 part in 6 parts of dry wood ash) or Hexyclan 5 per cent and 7 per cent are extensively practised in the affected areas, and have generally replaced the use of hopper dozers and grasshopper bags.

The Jola (Jowar) Ear Bug (*Calocoris angustatus* Lethierry) the Earfly (*Contarinia andropogonis* Felt) and the Ear webbing caterpillar (*Stenachroia elongella* Hampson) are three important pests of Jola ear, but are curiously limited in their distribution to Mysore and Mandya Districts. Since 1944, these pests have occurred regularly each year; the peak incidence in 1944-45 has, however, declined; the Jola ear Bug and Fly are the first to appear on inflorescence just-forming ears and tender grains in the milky stage, and these are followed by the webbing caterpillar, which infests the hardened grain and the harvested ears in stack. Field control of the pests is secured by a liberal dusting of equal quantities of tobacco and soap powders or Gammexane D.025 diluted with dry wood ash (1 : 4).

A cheap and simple bamboo plait duster has been devised, which could be made locally by the agriculturists themselves, for large-scale field dusting.

The Jola (Jowar) Stem Borer (*Chilo zonellus* Swinhoe) sometimes causes severe loss to the crop in Chitaldrug District; the young plants are generally infested, but in recent years the damage to grown-up plants has been serious, the caterpillar boring into the ear bearing stalks. Systematic collection and destruction of infested portions of stalks right from the initial stage is the only remedy available for the present.

The Jola (Jowar) Mite (*Paratetranychus indicus* Hirst) damages, sometimes very severely, jola leaves which turn reddish brown. It was serious during 1947-48 in Mysore District and northern parts of Chitaldrug District, but has declined now. The mite breeds in colonies under a thin web on the lower surface of leaves ; it spreads by crawling from plant to plant and also probably through the agency of wind; both young and grown-up plants are infested. Removal of badly affected leaves at the initial stages is a simple remedy. Dusting with flowers of sulphur (1 in 4 parts of dry wood ash) is effective.

Minor pests : The Jola Agromyzid Fly (*Atherigona indica* Malloch) occurred on a small scale round about Bangalore and damaged young seedlings The army worm (*Cirphis unipuncta* Haworth) was found damaging the leaves and tender ears in grown-up plants in certain localities in Chickmagalur District.

4. Sugarcane

The Sugarcane Stem Borer (*Argyria sticticraspis* Hampson) and the Top-shoot Borer (*Scirpophaga nivella* Fabricius) are the two most important pests of sugarcane occurring regularly each year throughout Mysore State. These pests are present all round the year, but the infestation is more serious in the summer plantings ; the attack by the Stem borer commences from the very early stage, whereas the Top shoot Borer generally infests fairly grown-up plants. The damage due to these two pests is extensive and severe, ranging from 15 per cent to 50 per cent. Systematic collection of egg-masses and dead-hearts and light earthing-up in the early stages are largely practised in the Sugarcane tracts. Since 1935 mass-production of *Trichogramma minutum* Riley, the well-known egg-parasite of the Stem Borer, is being undertaken in a special parasite Laboratory and the parasites liberated in large numbers in the sugarcane areas in Mandya.

The Stem-Borer (*Diatraea* spp.), the Root-borers (*Emmalocera* spp.), termites (*Odontotermes obesus* Rambur) the cane Mealy bug *Trionymus sacchari* Green, and the Root grub (*Holotrichia serrata* Fabricius) are generally of minor importance. During 1950, due to continued drought the Mealy bug became rather serious.

5. Pulses

Th field and Garden Bean (*Dolichos lablab*), which covers the largest acreage among the pulses in Mysore State, is attacked by the Pod borer (*Adisura atkinsoni* Moore) which is a major pest causing serious damage to the crop. Being a specific pest of seasonal crop, the pod borer moth makes its appearance generally by about the middle of October, when

the blossoms also appear ; the insect is active and passes two generations during the crop season in October-January ; the third generation caterpillars pupate in the soil and remain in a resting stage till the next season of the crop. Rubbing off of eggs on flower buds and blossoms and on younger green pods is a routine practice for the control of this pest. Dusting with DDT. (Guesarol-550) or Gammexane D.025 (mixed with 6 parts of dry wood ash) is also effective. *Microbracon brevicornis* Wesmael (Braconidae, Hymenoptera) is a natural larval parasite, and the parasitisation in the field ranges from 8.6 to 20 per cent. An allied species, *M. hebetor* Say which is the ectophagous larval parasite of *Corcyra cephalonica* Stainton, the common moth pest of stored rice, Jowar and flour, has been found to parasite successfully the pod borer : mass-production of this parasite in the laboratory and large-scale bulk-releases in the fields are now undertaken.

The Red gram plume moth (*Exelastis atomosa* Walsingham) and the Gram caterpillar (*Heliothis obsoleta* Fabricius) are common on red gram (*Cajanus cajan*), but the damage due to them is not normally serious, *Heliothis obsoleta* Fabricius attacks Bengal gram (*Cicer arietina*) also.

Other minor pests attacking different pulses are the gram pod fly (*Agromyza obtusa* Malloch), the Tussock caterpillar (*Euproctis fraterna* Moore) the Blister beetle (*Zonabris pustulatus* Thunberg) and the lablab bug (*Coptosoma cribraria Fabricius*). *Bruchus chinensis* Linnaeus attacks redgram and *Dolichos lablab* both in the later pod stage and in the store.

6. Oil Seeds

(i) Castor (*Ricinus communis*) :

The castor Semi-looper (*Achaea janata* Linnaeus) is a major pest of castor ; it is found almost over the entire state and causes considerable damage in certain seasons in some areas. Hand-picking of fullgrown caterpillars and red-brown pupae on folded leaves and dispersal of cooked rice to attract insectivorous birds are commonly practised ; in case of severe attack calcium or lead arsenate is sprayed. (1 lb. in 2 lb. of lime and 3 lb. of jaggery in 50 gallons of water). From among its natural parasites, *Microplitis maculipennis* Szepligeti is the most abundant and keeps the pest under check during certain seasons in some areas.

The castor shoot and pod borer (*Dichocrocis punctiferalis* Guenee), the castor slug caterpillar (*Parasa lepida* Cramer), the cutworm (*Prodenia litura* Fabricius), *Euproctis* sp. and the castor butterfly (*Ergolis merione* Cramer) are of minor importance.

(i) Ground nut (*Arachis hypogoea*) :

The Leaf-mining caterpillar (*Stomopteryx subsecivella* Zeller) is an important pest of irrigated ground nut all over Mysore State ; in some seasons it is serious and attacks both rain-fed and irrigated crops. Dusting with Gammexane D.025 (With equal quantity of dry wood ash) is effective ; adult moths are attracted to light-traps.

The surface grasshopper (*Chrotogonus* sp.) and plant lice (an unidentified aphis) are minor pests. In 1949-50 owing to continued drought, the aphis multiplied greatly and spread over extensive areas in Chitaldrug District (North Mysore); large-scale field dusting with tobacco powder (1 in 4 parts of dry wood ash) was employed and the pest was controlled effectively.

7. Potato (*Solanum tuberosum*)

Epilachna vigintioctopunctata Fabricius is a serious pest of potato crop in Mysore State : it also attacks other solanaceous and cucurbitaceous plants of economic importance, such as brinjal, cucumber, gourds, etc. Calcium arsenate spray (1 lb. in 2 lb. of lime and 3lb. jaggery in 60 gallons of water) is widely practised as a remedy. *Pleurotropis foveolatus* Crawford (*Chalcididae* Hym.) is a natural parasite the percentage of parasites in nature being 7 to 69 ; attempts are being made to rear this parasite in a suitable laboratory host which would enable mass-multiplication and bulk-releases in the field. Experiments are in progress to determine how best the insecticidal treatment could be combined with the biological control with a view to safeguarding the parasite. Indications are that BHC is detrimental to the parasite but this is not the case with Calcium arsenate. Pending conclusive results BHC is not being advised for the present.

The potato tuber moth (*Phthorimaea operculella* Zeller) infests potato tubers both in field and store. Seed potato is stored under a 2″ layer of sand, which affords protection against infestation by this pest.

8. The Sweet Potato (*Ipomoea batatas*)

The sweet potato weevil (*Cylas formicarius* Fabricius) is a minor pest of sweet potato.

9. Mango (*Mangifera indica*)

The Mango hoppers (*Idiocerus niveosparsus* Lethierry, *I. atkinsoni* Lethierry and *I. clypealis Lethierry*) cause severe damage to mango blossoms. Spraying with DeTane (a Murphy product) or DDT. (Guesarol-556) (1 lb. in 20 gallons of water) is found effective against this pest. The Fruit fly (*Dacus* sp.) is a minor pest : in some seasons the damage by these is substantial. The mango nut weevil (*Cryptorhyncus mangiferae* Fabricius) and the scale insects (*Pulvinaria* sp. and *Chionaspis vitis* Green) also occur, but cause little damage to the crop. The stem borer (*Batocera rubus* Linnaeus) and the castor slug (*Parasa lepida* Cramer) are minor pests.

10. Coffee (*Coffea arabica*)

The Coffee Stem Borer (*Xylotrechus quadripes* Chevrolat) is the most serious pest of *Coffea arabica*. Two emergences of the beetles in a year have been noticed, one in April-May and the other in October-November ; these two flight seasons are correlated to two life-cycles of the

beetles -(1) major or primary cycle in which beetles normally emerge from grubs developing in living coffee stems in the estates, having a development period of one year ; and (2) a short cycle in which beetles develop in drying coffee stems and in young plants (1-3 years old) having a development period of about six months. The stem borer is a specific pest of coffee plant in nature, though the beetle in captivity lays eggs freely and breeds in cut stems of plants like *Olea dioica, Tectona grandis, Pterocarpus marsupium* and other shade trees. The beetles have a partiality for open spaces and lighted patches in estates ; a well regulated shade therefore helps greatly in keeping down the borers. The North-east monsoon coincides with the egg-laying season and active period of the beetle ; accordingly the incidence of the borer is very much less in years of heavy monsoon. Swabbing of stems with a 10 per cent wood tar emulsion has been found effective against the pest. In the absence of sufficient quantities of this material, systematic removal and burning of all bored plants before the primary flight of the beetle are being enforced by legislation in the interest of the coffee industry in the state. Scrubbing of coffee stems to dislodge the eggs and very young larvae during the egg-laying season is also practised extensively. Recent trials with the new synthetic insecticides DDT and Benzene Hexachloride have given promising results ; dusting and swabbing the coffee stem with preparations of these chemicals are being tested by the Indian Coffee Board, Research Department.

The Green Bug (*Coccus viride Green*) sometimes causes serious damage in certain localities. but it is highly localised and confined to certain patches even in an estate. A spray with Fish oil rosin soap, Hongey oil soap or tobacco decoction (1 lb. in 8 gallons of water) is an effective remedy. A white fungus (*Cephalosperium lecanii* Zimm.) and a grey-black fungus (*Empusa lecanii* Zimm.) act as very effective checks to the multiplication of the pest in Mysore, provided monsoons are regular and normal. Wherever necessary the fungi should also be spread mechanically over the estate immediately after their appearance by tying up branches containing them to trees which do not show them.

The Shot-hole borer (*Xyleborus morstatti* Eggers) infests coffiee twigs, particularly of *Coffea robusta*, on which it is gradually increasing. The Red-headed borer (*Zeuzera coffea* Nietner) the coffee grass-hopper (*Aularches miliaris* Fabricius) and the Brown bug (*Saissetia hemisphaericum* Targioni Tozzetti) are occasionally found on coffee.

12. Cardamom (*Elettaria cardamomi*)

The Cardamom Thrips (*Taeniothrips cardamomi* Ramakrishna Ayyar) occurs in large numbers on cardamom plants and in addition to sucking up the plant sap infests the growing flowers and tender fruits causing malformation of the capsules. In cases of severe infestation, Nicotine sulphate —Black leaf 40-1 in 5,000 parts of water or tobacco decoction spray (1 lb. in 8 gallons of water + ½ lb. soap) is advocated. Dusting with Gammexane D.025 in fair weather is also effective.

The Cardamom Hairy caterpillar (*Eupterote canaraica* Moore) is a serious pest of cardamom, coffee and other shade trees, sometimes entirely defoliating them. Serious outbreaks of this pest occur in cycles at intervals of 13 to 15 years each when very severe and extensive damage is caused. The last serious outbreak occurred in 1945-46. Collection and destruction of congregating larvae on tree trunks and of pupae in the soil are advised. A white fungus (unidentified) attacks the caterpillars and keeps the pest in check; mechanical distribution of fungus-infected caterpillars in areas where it is not present helps in the wide dispersal of the fungus and checks the multiplication of the pest.

The Cardamom Shoot borer (*Dichocrocis punctiferalis* Guenee) a common pest of castor, also bores into tender shoots of Cardamom, but is a very minor pest.

PESTS OF CRUCIFEROUS VEGETABLES AND THEIR REMEDIAL MEASURES IN THE NILGIRIS

By P. R. Nagaraja Rao

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The cultivation of cruciferous vegetables is mainly limited to the Nilgiri Hills, parts of Kodaikanals and other hill stations in South India. These vegetables, especially cabbages and cauliflowers, are cultivated in the plains during winter months to a small extent but the success of such attempts, very often is a losing gamble due to insect attacks.

Pests and their remedial measures

Cut-worms (*Agrotis species*) : This is a serious pest of cabbage and cauliflower seedlings. The cut-worms attack the seedlings in the nursery as well as in the transplanted plots. They nip off the seedlings just above the ground level, causing the seedlings to wither and die. The loss sustained is anything between one ton of vegetable per acre to the total loss of the crop.

The method of combating this pest is by the application of either a BHC 5 per cent or a DDT 5 per cent dust. The seedlings in the nursery are dusted, while in the transplanted plot, the insecticide is applied close around the plant after loosening the soil. This has been found quite effective in warding off the attack and killing the caterpillars. Seven to eight pounds of insecticide are required per acre, costing about Rs. 2 to Rs. 3. During 1950, 108.50 acres were treated in the above manner in Nilgiris saving a yield of 99 tons from this pest. This has become a popular remedial measure.

Root maggots (*Delia brassicae* Bouche) : Another of the more serious pests is the cabbage root fly. It lays its eggs around the stem of the plant near the soil, which hatch out a few days later. The maggots are ¼" or less in length and are creamy white in colour. The maggots eat their way down to the roots of the plants and cause the plants to wilt. The damage is not always apparent at the commencement but becomes pronounced after the wilting of the plants. The maggots cannot be easily got rid of, when once they obtain an entry into the roots of the seedlings and therefore any remedial measure should be preventive.

Half to one ounce, per plant, of freshly slaked lime, powdered and kept over for 24 to 48 hours and applied at the transplanting time in transplanting holes with artificial manure has been found to ward off infestation. The incorporation into the soil before sowing, of about 1.5 to 2 pounds of BHC gamma isomer in a dust formulation gives practically a complete control. The dust has to be thoroughly incorporated into the soil to a depth of 7 to 8". During last year 15.00 acres received such treatment and the total loss of the crop by the pest was prevented.

Roughly 7-8 lbs. of BHC dust are required per acre for dusting. The cost of labour and insecticides comes to Rs. 5|6|- per acre. At the lowest level 1 ton of cabbage or a little less of cauliflower will be saved by such treatment which works out to a value of Rs. 110|- to Rs. 130|-. The gain is often more as the tonnage of yield saved is very often greater than a ton per acre.

The cabbage borer (*Hellula undalis* Fabricius) : This is a sporadic pest. The larva is about ¾ to 1″ long and pale whitish brown in colour. This pest appears during wet weather, feeds on leaves and shoots and finally enters the stem and causes the plant to rot.

Spraying with a 50 per cent DDT suspension dust at one pound in 40 gallons has been found effective. Two to two and a half pounds of insecticide would be required per acre. The treatment may have to be repeated 2 or 3 times at fortnightly intervals, in the case of a serious infestation, to establish complete control. By such treatment one ton of yield per acre has been saved from the pest.

The Diamond-back Moth (*Plutella maculipennis* Curtis) : The damage from this pest is very serious on cauliflower curds. The caterpillar is small, slender and pale green. During drought conditions this insect assumes pest proportions. The remedial measure is the same as for the cabbage borer.

Two to two and a half pounds of 50 per cent DDT suspension powder are required for spraying in about an acre. Approximately 1 ton of yield is saved per acre by such treatment. At a cost of Rs. 10|- per acre by the treatment, Rs. 150|- are gained by way of saving in yield.

Among less important pests of cruciferous vegetables are aphids appearing at all stages of the crop and the Pentatomid bug, *Bagrada cruciferarum* Kirkaldy damaging the seedling. Both appear during periods of drought. Aphids are controlled by spraying fish-oil-resin soap at one ounce in one gallon of water and the bug is controlled by dusting a 5 per cent BHC powder on the young seedlings.

The remedial measures against the pests of cruciferous vegetables like cabbage and cauliflower deserve considerable attention, in that these vegetables give a good tonnage of yield per acre on the hills and fetch good price in the market.

WHEAT RUST SITUATION IN VARIOUS STATES OF INDIA DURING 1950-51

Uttar Pradesh — by P. R. Mehta[1]

The state of Uttar Pradesh has about 8 million acres under wheat. Climatically, the area of wheat can be divided into two regions—plains and hills. In the plains the crop is normally sown by the end of October and harvested by the middle of April. In the warmer eastern districts, the harvesting is one to two weeks ahead of the cooler western districts. In the hills, the crop is sown up to the end of November and the harvesting commences from the end of April and continues up to the middle of June, depending upon the altitude.

Yellow and orange rusts of wheat were reported from most areas by the middle of January, but weather conditions were not conducive to the development of these rusts. The wheat crop was practically *rust free* all over the State—both in the plains as well as on the hills. The winter rains were invariably followed by cold waves which evidently was a contributory cause for absence of the rusts. Black rust was reported in traces from some areas late in the season, when the crop was almost nearing maturity.

North Gujrat — by N. Prasad[2]

The wheat crop during the year under report has been an excellent one from all points of view. Hardly any damage has been caused by the Black Stem rust. Just a few spots could be noticed in an acre of wheat and it can be safely concluded that no damage was caused to wheat in this area due to rust.

Rajasthan — by M. L. Gattani[3] & R.L. Mathur.

The year under review was relatively a very dry year and as such wheat rusts did very slight damage in Rajasthan. Reports of the incidence of wheat rusts were received only from Jaipur and Sri Ganganagar districts of Rajasthan.

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In Jaipur district Black rust of wheat appeared, about February 15, 1951, in very minute traces and did not spread any further. The principal wheat varieties in this area are Local and C591.

In Sri Ganganagar district, the yellow rust of wheat was fairly severe. The principal wheat varieties in this area are C591 and Punjab 8. The percentage of infected plants was 10 and the severity of infection was about 60 per cent in both the varieties. It is rather interesting to note that C591 which is reported to be highly resistant to yellow rust in the Jaipur and Jodhpur divisions, showed such a high infection of rust in Sri Ganganagar district. This may be due to the fact that the race or races of yellow rust prevalent in that area may be different from the race or races of yellow rust prevalent in Jodhpur and Jaipur divisions. It may also be remarked that in this area the winter temperature get very low as compared to the other districts of Rajasthan.

Madhya Bharat **by B. G. Nikam[1]**

The Union of Madhya Bharat comprises of three climatic zones ; Northern, Central and Southern, wherein 16 lakh acres of wheat crop consisting of local durum and vulgare wheats are grown, mostly under dry conditions. The area under wheat is mainly concentrated in the Northern and Central Zones.

Usually all three types of rusts occur, either in mild or severe form depending upon weather conditions. When there is cloudy and rainy weather in the months of January and February rusts usually take a severe form.

This year the crop was generally free from rust all over Madhya Bharat. However, the crop grown nearby rivers and dams had severe attack of yellow and brown rusts in February. It has been observed that the early sown crop usually has less or no rust.

Madhya Pradesh **by R. P. Asthana[2]**

Black rust of wheat appeared in January 1951, at Nagpur, Powarkhera, Chhindwara, Chikhali, Harda, Raheli, Jubbalpur and Hoshangabad on Haura, NP 4, New hybrid, Sarbati, Local Harda, Desi pissi, AO 90 and A 115 varieties respectively. The infection, during the short congenial period, remained as "stray" and "almost negligible" on Haura and NP 4, while on New hybrid, Sarbati, Local Harda, Desi pissi, AO 90 and A 115 it spread over 30-50 per cent plants. As the weather changed the spread of rust was arrested and it did not cause any epidemic or damage this year.

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[2]Mycologist to the Government of Madhya Pradesh, Nagpur.

Assam by S. Chowdhury[1]

Wheat is not cultivated in Assam to any appreciable extent except in Goalpara district where on the *Chara* of Brahmaputra it is cultivated quite extensively. In the other districts of the State a few small plots of wheat are come across here and there. In the current year crop no incidence of rust was reported from any of the districts of the State.

Bhopal by J. K. Dubey [2]

While 1950-51 was a rust free year and none of the 18 varieties of wheat sown in the Bhopal State were rusted, a small plot of A.O. 13 wheat, which was water logged due to excessive irrigation and percolation, got heavily infected with black rust, *Puccinia graminis tritici* late in January.

Bihar by J. N. Mishra [3]

At Sabour brown rust appeared first towards the middle of January and orange rust was noticed by the end of that month. Black rust appeared last of all, in the last week of February. The rusts were not severe and the percentage of infection varied from 3 to 5. In North West Bihar, near the foot of the Himalayas, yellow rust, normally appears in a severe form. Last season, up to 25 per cent of the plants were found infected

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[2]Director of Agriculture, Bhopal.

[3]Mycologist to the Government of Bihar, Sabour, Distt: Bhagalpur.

RECORDS OF DISEASE OCCURRENCE

SOME HITHERTO UNRECORDED FUNGUS DISEASES OF KUMAUN AND GARHWAL REGION OF UTTAR PRADESH

by S. K. Bose[1]
&
P. R. Mehta[2]

Introduction

Garhwal and Kumaun regions form the northern boundary of the Uttar Pradesh. These hilly regions have a definitely temperate climate at higher altitudes, whereas in the valley areas the climate although more tropical, is different from that of the plains. The Agricultural practices are also different from those of the plains. Potato, Wheat, Paddy, Soyabean, Millets, etc., are commonly grown in the area. At higher altitudes temperate fruits are grown, whereas in the valley areas tropical fruits such as Mango, Loquat, Litchi, Banana, Pomegranates, Grapes, Citrus etc. do very well. Diseases of temperate fruits have been recorded previously. (I.C.A.R. Miscellaneous Bulletin 51, 1942). Survey has now been undertaken of the diseases of fruits and fruit trees of the valley area and of the foot hills. In the present note some of the diseases not previously recorded from the U.P. appear to be common in the area, are recorded.

Potato Diseases.—

Soft-rot (*Erwinia carotovora*), *Brown-rot* (*Pseudomonas solanacearum*) and Flesh spot of tubers (*Pseudomonas solaniolens*) seem to be common bacterial diseases in the Kumaun hills. Wilt (*Fusarium solani*) and Tuber rot (*Sclerotium rolfsii*) were very common at Bhowali.

Citrus Diseases.—

Canker (*Xanthomonas citri*) and Sooty mould (*Capnodium citri*) appear to be common diseases in the hill area. Die-back (cause not yet ascertained) appears to be a common and serious disease of Malta oranges.

Grapes.—

Sooty mould (*Capnodium* sp.) and Powdery mildew (*Oidium* sp.) occur commonly on the grapes.

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[2] Plant Pathologist to Government, Uttar Pradesh, Kanpur.

Diseases of Loquat (*Eryobotrya japonica*).—

Die-back and stem canker : (*Botryosphaeria* sp. and *Dothiorella* sp..). Loquat is commonly grown at the foot hills and submountain regions of Kumaun. Most of the trees were found affected with stem canker and die-back. The two fungi noted above were invariably present in association with the disease. The pathogenecity of these fungi is being investigated.

Disease of Apricot (*Prunus armeniaca*).—

Leaf curl (*Taphrina deformans* ?) was noticed at Ranikhet.

Peach Diseases.—

Poria prunicola was found on the stem and branches of living peach trees at Ranikhet. Another species of *Poria* was noticed on living branches of Peach trees at Pauri (Garhwal District).

Guava Diseases.—

Mummy disease (*Colletotrichum psidii*) appears to be common in the valley areas of Kumaun. Twigs of guava showing die-back symptoms gave cultures of *Pestalotia psidii*. This fungus has also been isolated from red spots present on fruits.

A species of Cercospora was frequently isolated from spotted leaves of guava seedlings.

Disease of *Achras sapota*.—

From mummified fruits cultures of *Pestalotia sapotae* has been frequently isolated. The same fungus has frequently been isolated from fasciated branches at Kanpur and Kathgodam.

Pomegranate Diseases.—

Fruit rot and leaf spot (*Phomopsis sp.*?) appears to be a common disease in the Kumaun.

Apple Diseases.—

This year, in the Government Garden, Chaubattia (Ranikhet), many apple fruits started rotting while still attached to the trees. They became brown, water soaked and were ultimately shed. The rot was due to *Phytophthora cactorum*.

Grass Diseases.—

The following smuts appear to be of common occurrence on the different grasses :—

Neovossia barclayana on Pennisetum orientale; Ustilago cynodontis on *Cynodon dactylon*.

Ustilago paradoxa on Panicum frumentaceum : Ustilago neglecta on *Setaria glauca*.

Balansia andropogonis, forming sclerotia like structures at the axils of leaves of *Andropogon* sp., is a common disease at Ranikhet.

Sclerotia of Ergot (*Claviceps purpurea*) were observed in the inflorescence of *Brachypodium sylvaticum* at Ranikhet.

Miscellaneous.—

A large number of dead chestnut defoliating beetles (*Brahaminia* sp.) was found clinging to the foliage and branches of chestnut by their mouth parts. These dead beetles were parasitised by a species of *Entomopthora*. This fungus differs from the common species E. *sphaerosperma*, recorded in Europe and U.S.A., in having spiny-walled zygospores.

Polyporus versicolor was common on oaks at Mussoorie and Ranikhet.

Hymenochaete damaenicornis was common on grounds at Chaubattia. The same fungus was noticed on roots of living plants of *Dalbergia sisso* at Kanpur.

Sphaerotheca hydropiperis was found on *Polygonum flacidum* at Ranikhet.

LEAF ROLL OF CHILLIES IN RAJASTHAN

by M.L. Gattani
&
R. L. Mathur [1]

Chillies is an important cash crop and is cultivated extensively in Rajasthan. Leaf roll of chillies, a virus disease, popularly known as "Bobri" causes extensive damage in the state of Rajasthan. The plants attacked by this disease remain stunted, the leaves roll and the production of fruits is greatly retarded. When fruits are produced by the diseased plants they remain very small in size.

During 1950-51, the disease caused 60 per cent damage in Mathania (District Jodhpur), Bilara, Jaitaran and Pali of Jodhpur division and almost 100 per cent damage in the Kapasin district of Udaipur Division. In Alwar district of Jaipur Division the damage was about 75 per cent.

Near Hemavas in Pali district the entire crop of one of the indigenous varieties of chillies succumbed to the disease, but the plants of another indigenous variety, which were growing along with the susceptible one, completely escaped infection. Such plants produced normal fruits and were prefectly healthy whereas the diseased plants were stunted in growth and hardly produced any fruits. Selections from the virus tolerant indigenous variety have been made and are being further tested and multiplied for distribution in the disease affected areas of Rajasthan.

INCIDENCE OF DISEASES IN BHOPAL STATE DURING 1950-51.

by J. K. Dubey [2]

Local Jaliteia wheat was rather heavily infected with loose smut. *Ustilago tritici*, and also to some extent with the earcockle disease.

Jowar was rather severely affected with smut, *Sphacelotheca sorghi*, while oats and barley were affected to a certain extent by *Ustilago kolleri and Ustilago hordei* respectively.

Eradication of the smutted wheat plants was carried out.

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RELATION BETWEEN AMOUNT OF INITIAL INOCULUM AND SEVERITY OF WHEAT STEM RUST OUTBREAK IN PENINSULAR INDIA

By M. K. Patel.

Plant Pathologist to the Government of Bombay, Poona.

An epidemic of stem rust of wheat is initiated through intense spore showers. It further develops as a result of successive generations of spores produced locally. As each seat of infection is caused by one or more viable spores, it is reasonable to assume that large quantities of such spores are necessary for producing infections of epidemic proportions. It should be noted that not all spores fall on the wheat plants, many fall on the ground or on other plants; it can be assumed without hesitation that the actual number of spores which take part in causing an epidemic is therefore only a fraction of the spores produced in a given locality.

An abundance of inoculum is thus a pre-requisite of a stem rust epidemic. Freeman and Johnson point out that when spores are unusually abundant in early summer the first infections may be heavy and widespread and the chances for an epidemic may be thereby increased. Stakman has also emphasized this point in connection with the early spread of aeciospores from infected barberry plants. Under Nebraska conditions, one of the principal factors involved in the development of black rust epidemic is, according to Peltier, an abundance of initial inoculum and Levine concurs in this view. In his analysis of the condition that must exist to permit stem rust to spread from the southern to the northern parts of the Mississippi Valley in the U.S.A., Stakman states that the production of immense number of spores is necessary in the southern part of that area. Craigie is of the opinion that, as a rule, stem rust could scarcely reach epidemic proportions in Western Canada unless the initial inoculum arrived moderately early and in considerable abundance, and increments of additional inoculum arrived subsequently from time to time.

The time-lag between the initial infection and the production of spores in the resulting sorus is about a week, under favourable conditions of temperature and moisture. It is evident, therefore, that if the initial inoculum is limited the number of sori and the spores produced by them will be few and the time required for stem rust to reach epidemic proportions, in any given area, will be considerably longer, other things being equal. The addition of the secondary spores to the initial inoculum will, in such cases, be slight and chances for epidemics are not likely to be encouraging. It is only when the initial inoculum is limitless the secondary spores are quickly produced to bring about successive heavy spore-showers and that a severe epidemic would develop. In any programme that is chalked out for reducing wheat stem rust epidemics, these premises should be kept in mind.

In the State of Bombay, it is an established fact that the stem rust inoculum travels from South to North. An examination of the dates of appearance of rust at different plases will clearly prove this fact. This has been observed to be true even with *kharif* wheat in 1944.

Summary of rust affected wheat samples received in 1948-49.

Sl. No.	District	Earliest date of rust appearance (stem rust)
1	Dharwar	First fortnight of November 1948.
2	Belgaum	First week of November 1948.
3	Bijapur	About 15-11-48.
4	Satara	15-11-48.
5	Poona	26-11-48 (Kamthadi).
6	Nasik	20-11-48 to 27-11-48
7	Ahmednagar	10-12-48.
8	Sholapur	4-12-48.
9	Kaira	3-1-49.
	1949-50.	
1	Satara	25-11-49.
	Dharwar	
	Poona	
2	Ahmednagar	15-1-50.
3	West Bengal	30-1-50.
	East Khandesh	
	Surat	
4	Amreli (Saurashtra)	February 1950.
	1950-51.	
1	Dharwar	8-11-50.
2	Satara	January 1951.
3	East Khandesh and Poona ..	February 1951.

If the April-May sown crops in Nilgiris and the kharif crop in Mysore and Bombay are allowed to grow without restriction, it is natural to assume that the initial amount of the inoculum will be large. and, if favourable weather conditions prevail, heavy outbreaks of rust would necessarily develop within a short time after sowing wheat. No doubt, the crop in the southern districts of Bombay would first get infected. In 1948-49, the wheat crop in Dharwar and Belgaum districts

was almost a failure due to rust. But for the intervention of dry period, the crop in the central and northern districts would have been seriously affected as a result of the large number of spores carried by wind from the southern districts. The establishment of epidemic conditions in the southern districts is again dependent on the early arrival of an abundant supply of wind borne inoculum, unless this is already present locally on kharif sown wheat. There is thus no doubt that by reducing the amount of inoculum at source by prohibiting summer wheat cultivation, the development of epidemic of rust in the Southern districts will be delayed and the crops in the Northern districts and those in Hyderabad and Madhya Pradesh will consequently be saved.

It is sometimes contended that rust will develop into epidemic proportions irrespective of the quantity of the initial inoculum since a large number of spores are produced in a single generation. This is a mere hypothesis and not supported by the observations of the different investigators mentioned above. In the Nilgiris, grasses other than wheat and barley are affected by black rust but the amount inoculum that would arise from such stray grasses which are not after all cultivated as crops, would not be very large.

Apparently the public has not yet been convinced of the harmful effects of the practice of sowing wheat in the kharif. It is stated that in some of the southern Talukas of the Bombay State wheat cannot be cultivated in the Rabi season as the soil is not retentive. Still, instead of sowing wheat in the kharif season the farmers should be compelled to grow jowar which after all is the main crop of the tract. The wheat crop, if it is grown at that time, is not economically remunerative, according to observations made by the District Agricultural staff of the Bombay Department of Agriculture.

The following suggestions are made:—

1. The clean-up in the Nilgiri hills should be thorough. Even if this is not possible the scheme should not be abandoned altogether because lesser the area under wheat in these tracts in summer, lesser the inoculum to start the epidemics. The direct beneficiaries of these measures in the Nilgiris are the States of Bombay, Madhya Pradesh, Saurashtra, Central India and Hyderabad and these States should be persuaded to share if necessary a part of the expenditure, because of the accruing benefits, or let the Central Government bear the entire expenditure as U.S. Department of Agriculture does for barberry eradication.
2. If the scheme of prohibition of summer wheat cultivation is to be continued, not only should the notification be rigorously enforced but the willing co-operation of Revenue Departments should be forthcoming, because without their help it would be difficult to locate a few acres of wheat in the midst of large areas under jowar.
3. Even if the clean-up programme is not a complete success the effect of the partial success should not be ignored.

PLANT QUARANTINE IMPORT RESTRICTIONS IN INDONESIA*

A summary of the Plant quarantine import restrictions of Indonesia has been given below for the information of nurserymen, Plant quarantine officials and others interested in the export of plants and plant products from India to that country :

Commodity affected	Pests and Diseases whose entry is being prevented	Degree of prohibition	Date of promulgation
Hevea brasiliensis, living plants and parts thereof from S. America.	..	Prohibited ..	Law of September 27, 1926, article as amended by that of October 14, 1932.
Hevea brasiliensis seeds from S. America ..	..	Restricted ; imports under special authorization from the Director of Agriculture, Industry and Commerce.	Decree of September 27, 1926 as amended by that of October 14, 1932.
Hevea brasiliensis : Seeds, living plants and parts thereof from countries other than S. America.	*Dothidella ulei* *Fusicladium macrosporum* Kuyper. *Phytophthora faberi* Maub. *Phytophthora meadi* McRae	Imports permitted if accompanied by a phytosanitary certificate from country of origin affirming that they are free from *Dothidella ulei*, *Fusicladium macrosporum* Kuyper, *Phytophthora faberi* Maub., *Phytophthora meadi* McRae.	Section V, article I (4) Decree of January 25, 1949, No. 360/L.V.
Plant material other than that itemized in section IV of the Decree of November 3, 1926.	..	Imports allowed if accompanied by a Phytosanitary certificate† by a competent official of the country of origin.	Section V, article 1, Decree of November 3, 1926.

* Extracted from Summary given in U.S. D.A. Service and Regulatory announcements, January-December, 1949, S.R.A.—B.E.P.Q. 175, Issued June, 1950.

† A competent Official of the Government of the country of origin or one of the warders thereof must sign the Phytosanitary certificate certifying (*a*) indicating the species to which plant material belongs or from which it was derived ; (*b*) the quantity and the weight thereof and (*c*) affirming that at the time of shipment the said material was, according to his conviction, free from pests and diseases of cultivated plants.

Commodity affected	Pests and Diseases whose entry is being prevented	Degree of prohibition	Date of promulgation
Potatoes	*Synchytrium endobioticum* (Schilb.)	Restricted; Consignments must be accompanied by certificate of competent authority of country of origin affirming that potatoes have been found free from wart diseases, and the disease does not occur in the field in which the potatoes were grown, nor within a radius of 500 meters therefrom.	Section V, article 1 (2) Decree of November 3, 1926, and the Decree of October 21, 1929. (See p.p. 8 and 10).
Plant material from China	..	No certificate of competent authority required, but the shipment will be subject to inspection on arrival.	Section 4, article 1, (5) Decree of November 3, 1926.
Fruits from foreign countries (except China)	..	Restricted; must be accompanied by a certificate issued by a competent authority of the country of origin affirming freedom from pests and diseases of cultivated plants, inspection on arrival and release only on issuance of an import permit.	Decree of October 21, 1929.
Fruits assembled in the Netherlands	..	Restricted; must be accompanied by certificate issued by the phytopathological Service of Netherlands.	Section V, article 1 (6), Decree of November 3, 1926.
Cacao plants (*Theobroma Cacoa* L.) from America.	..	Declaration by a competent authority of country of origin that they were grown in Europe in European soil from seeds produced in America.	Section V, article 1 (7)* Decree of November 3, 1926.
Flaxseed (*Linum usitatissimum*)	..	Special permit required for its importation.	Section V, article 1 (8), Decree of January 1, 1934.

* Article 7. This decree does not apply to the importation of: (*a*) living plant material for the importation of which special regulations are or will be established, (*b*) seeds obviously intended for consumption and (*c*) living plant material to be indicated by the Secretary.

Importstion unrestricted of plant material itemized in section IV of the Decree of November 2, 1926, and as given below:

(*a*) Seeds of the following-named vegetables, herbs, fruits, and medicinal plants:

Anetheum graveolens L., dill
Anthriscus cerefolium Hoffm., chervil.
Artemisia abrotanum L., southernwood
Asparagus officinalis L., asparagus
Capsicum annum L., red pepepr
Cichorium intybus L., chicory, witloof
Coriandrum sativum L., coriander
Cynara scolymus L., globe artichocke
Foeniculum vulgare Hill, fennel
Fragaria spp., strawberries
Lactuca sativa L., lettuce
Lavandula (*officinalis*) *vera* D. C., lavendar
Leontodon, see Taraxacum
Lycopersicum esculentum Mill, tomato
Melissa officinalis L., balm
Mentha spp., mints
Ocimum basilicum L., basil
Origanum majorana L., majoran
Pastinaca sativa L., parsnip
Pimenta officinalis Berg., allspice
Pimpinella anisum L., anise
Portulaca oleracea L., purslane
Rheum rhaponticum L., rhubarb
Ribes spp., currants and gooseberries
Rosmarinus officinalis L., rosemary
Rubus spp., blackberries, raspberrie
Rumex spp., sorrel
Salvia, spp., sage
Satureia spp., savory
Scandix—see Anthriscus
Scorzonera hispanica L., black salsify
Solanum melongena L., eggplant
Spinacea oleracea L., spinach
Taraxacum officinale Weber, dendelion
Tetragonia expansa Thunb., New Zealand spinach
Thymus vulgaris L., thyme
Valerignella olitoria Moench, cornsalad

(*b*) Seeds of ornamental of plants belonging to the following genera:

Abutilon
Adonis
Ageratum
Agrostemma
Althaea
Alyssum
Amaranthus
Ammobium
Anemone
Antigonon
Anthirrhinum
Aquilegia
Arcetotis
Aristolochia
Asparagus
Aster
Begonia
Bellis
Bidens
Boltonia
Boussingultia
Buphthalmum
Cacalia
Calceolaria
Calendula
Campanula
Canna
Carduus
Celosia
Centauria
Chrysanthemum
Cineraria
Clarkia
Clematis
Clerodendron
Cobaea
Coleus
Convolvulus
Coreopsis
Cosmos
Cuphea
Cyclamen
Cynara
Cynoglossum
Dahlia
Delphinium
Dianthus
Digitalis
Dimorphotheca
Eccremocarpus (Calampelis)
Eschscholtzia
Gaillardia
Gerardia
Gerbera
Gilia
Gloxinia
Gomphrena
Gypsophila
Helianthus
Helichrysum
Heliotropium
Helipterum (*Acroclinium*)
Hibiscus
Impatiens
Inula
Ipomoea
Kniphofia (*Tritonia*)
Leptosiphon
Linaria
Lobelia
Lynchnis
Matricaria
Maurandia
Mediola
Mimulus
Mirabilis
Myosotis
Nemesia
Nemophila
Nicotiana
Nigella
Nycterinia
Oenothera
Passiflora
Pelargonium
Pentstemon
Perilla
Petunia
Phacelia
Phlox
Physalis
Poinsettia
Portulaca
Potentilla
Primula
Pyrethrum
Quamoclit (*Mina*)
Reseda
Ricinus
Rhodanthe
Rosa
Rudbeckia
Salpiglossis
Salvia
Sanvitalia
Saponaria
Scabiosa
Schizanthus
Senecio
Silene
Solanum
Stevia
Stokesia
Streptocarpus
Tagetes
Thelesperma (*Cosmidium*)
Thunbergia
Tithonia
Torenia
Trachelium
Tropaeolum
Verbena
Vinca (*Lochnera*)
Viola
Volutarella (*Amberboa*)
Zinnia

(*c*) As amended by Decree No. 7345-A, August 12, 1929: No. 9760-A-Z, November 2, 1936 and No. 365/HAD/LV, April 12, 1948.

1. Vegetables, onions, bulbous plants (except potatoes), beets, and root crops intended for cunsumption or medicinal purposes;
2. Shallots and garlic;
3. Dried fruits and parts thereof, such as almonds, peanuts, grain, chestnuts, caraway seeds, cloves, Jesuit's nut (Trapa bicornis L., T. natans L., ling-kok), nutmegs, walnuts, pakwo, pepper, rice, etc., for consumption or medicinal purposes.

(*d*) Coconuts from which the husks have been removed.

(*e*) Spawn of edible mushrooms (Psalliota).

(*f*) Apples and pears, imported from the Netherlands by parcel post.

Importation of seeds of the following plants is not permitted until the seeds and the packing material in which they were shipped, have been inspected and disinfested at the port of entry.

Allium spp., chive, garlic, leek, onion, shallot, etc.
Apium graveolens, celery
Brassica spp., brocolli, cabbage, cauliflower, kale, kohlrabi, mustard, pak-tsai, pe-tsai, rutabaga, turnip, etc.
Cheiranthus, wallflower
Cochlearia, scurvygrass
Cucurbits, cucumber, melon, etc.
Daucus, carrot
Gossypium, cotton
Iberis, candytuft
Lepidium, cress, peppergrass
Lunaria, honesty
Matthiola, stocks.
Medicago, alfalfa
Melilotus, sweetclover
(*Nasturtium*) *Radicula-nasturtium-aquaticum*
Onobrychis, sainfoin
Radicula armoracia, horseradish
Raphanus, radish
Sinapis, see *Brassica*
Sisymbrium, see *Radicula-nasturtium-aquaticum*
Trifolium, clover

The above provision does not apply with respect to shipments of seeds of the plants named therein, if the declaration is made in the phytosanitary certificate issued by the competent authority of country of origin that the seeds have been disinfected in a disinfection plant operating under supervision of the service.

Authorized ports of entry.

(*a*) For seeds, living plants and parts thereof: Tandjoeng Priok, Medan (Belawan Deli), Soerabaja and Makassar.

(*b*) For fresh fruits:—Tandjoeng Priok, Semarang, Soerbaja, Sabang,* Palembang, Djambi,* Medan (Balawan Deli), Tandjoeng, Pandam, Pontianak, Lingkas, (Tarakan),* Samarinda, Balikpapan, Manado, Makassar, and Sorong.*

(*c*) For potatoes: Tandjoeng Priok, Medan, Lingkas (Tarakan),* Semarang, Soerabaja, Balikpapan,* Makassar, Palembang,* Pangkalpinang,* Tandjoengpandan,* Djambi,* Sorong,*

(*d*) For tea seeds: Tandjoeng Priok, Medan and Palembang.

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* These ports are authorized only for the entry of commercial shipments (see decree of April 12, 1948, No. 365/H.A.D.L/L.A.).

AMENDMENTS OF THE AUSTRALIAN PLANT QUARANTINE REGULATIONS*

The new regulations in this amendment include two in which insect pests are mentioned. One of them places restrictions on the import of potatoes into Australia and includes a provision that potatoes shall not be imported unless they were grown in an area free from *Leptinotarsa decemlineata* Say, and were individually found to be free from insects immediately before export. The other prohibits the importation of plants or parts of plants of 17 specified genera of the natural orders Amaryllidaceae, Liliaceae and Iridaceae except under permit. The plants are to be accompanied by a certificate issued in the country of origin stating that they were grown in an area free from *Merodon equestris* F., *Eumerus strigatus* Fall., and *E. tuberculatus* Rond., or that they have been subjected under supervision to specified treatments before shipment. The treatments comprise fumigation with methyl bromide at 3 lb. per 1,000 cu. ft. space for four hours at 70° F. or with hydrocyanic acid gas at 18 oz. per 1,000 cu. ft. for 24 hours at a temperature between 60 and 65°F., or hot-water or vapour-heat treatment in which the temperature is raised to 110°F., and maintained at the level for not less than 1½ hours.

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*Statutory Rules 1950, No. 27 4 pp. Canberra, 1950. Extract from Review of Applied Entomology, Ser. A, Vol. 38, p. 457.

NOTES AND NEWS

Pest Killers Must Not Be Man Killers*

The great increase in the use of toxic insecticides and herbicides has caused a number of casualties, some of which have proved fatal. Certain very important spray chemicals are extremely toxic but their effectiveness in dealing with otherwise insoluble problems is so great as to render them indispensable. The toxic risks attendant on these spray chemicals for the control of pests and weeds fall into two categories namely: (1) acute poisoning of the spray operatives on the spraying machines and with some insecticides other agricultural workers present on the site of spraying during or immediately after treatment and (2) chronic poisoning of operatives or of consumers of treated foodstuffs. The first requirement in the safe use of a toxic material is an adequate knowledge of the mammalian toxicity of the compound. In the last three years there is intensification of study on the toxicology of the products and development of protective measures and antidotes to the poison. It is also important that measures recommended are such that workmen can comfortably comply with them.

With many of the toxic spray chemicals, weekly medical supervision and examination are necessary. Work people engaged in spraying must be made safety conscious, and this is only possible with a fairly high standard of intelligence and skill on part of the spray operative. The following safety rules must be complied with:

1. A complete prevention of contamination by placing the operative in a gas-proof air-conditioned cab fitted on the tractor, which precludes any possibility of skin contact with spray drift and inhalation of toxic fumes and also ensures pleasant working conditions.
2. Minimising the necessity for handling spray chemicals. Resorting to bulk handling methods, use of anti-splash tins are better.
3. The use of protective clothing—garments should be such that any contamination due to splashing etc., should be immediately visible.
4. The issue of prophylactic drugs and supplementation of the diet to increase resistence.
5. A regular medical examination so that dangerous quantities of toxic substance in the blood be diagnosed.
6. Provision of first-aid equipment and drugs.

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*Abstracted from an article by W. E. Ripper in World Corps, II, (II), 474—477.

7. Training of the operatives in "safety consciousness" by suitable lectures and the institution of a safety council in the organisation, before which supervisors-in-charge of the work people, must vindicate themselves in the event of an accident.

8. Constant technical supervision of all spray operations by fully qualified personnel.

An intensive study of the casualities which have occurred in the U.S.A., and France, has proved that the observance of each one of these eight points is indispensable if safety is to be guaranteed.

Chronic poisoning may be caused (a) by continuous exposure of work people to spray chemicals or (b) by consumption of badly sprayed food stuffs. Observation of the 8 points of safety above mentioned helps to overcome the first type of hazard, while measures taken in compliance of the Food and Drug Act (of U.S.A.) i. e., to wash the crops well before selling to public and inspection for spray residues etc. will help to overcome the second set of hazards. The recent large number of new insecticides and weed killers has made it necessary to establish a number of new tolerances for this purpose and a hearing of the Government and industrial pharmacologists and entomologists before a Committee of attorneys attached to the Federal Drug Administration has been in progress in the U.S.A. Below are given a few of the tolerances which are in force today in California:

	grains per lb.
Fluorine	0.049
Arsenic (Arsenic trioxide)	0.025
Lead	0.050
DDT	0.049

In order to prevent toxic residues on and in plants it is vital to know the half-life of spray residues. It is necessary to state how long residues are likely to remain active and consequently what interval should be allowed between spraying and harvesting.

The manufacturers of spray chemicals must study the actual toxicities of new spray chemicals on which the establishment of tolerances for toxic residues can be based.

The manufacturers of spraying machinery must keep in mind, while designing the machines, the safety of the operatives. The most important provision is that of a gas proof air-conditioned cab in which the operator can work safely and comfortably.

Contractors should employ supervisory staff who have the necessary professional qualifications. In the most progressive countries it has become a legal requirement for a contractor to obtain a licence before operation.

Gassing Powders for Rabbit Destruction—New Scheme for 1951[1]

The former arrangement for financial assistance towards the cost of a cyanide gassing powder for rabbit destruction expired on December 31, 1950. A new scheme which aims at increasing the availability of approved cyanide gassing powders, will do away with the "permit" procedure, and will enable farmers to buy direct from their own stockists.

A modified form of financial assistance has been arranged direct with the manufacturers, who have undertaken that the retail prices for a fixed period of three years from January 1, 1951, shall not exceed 15 s. per 7-lb. container, or 21 s. per 10-lb. container.

So far, approval under this scheme has been given to:

Plant Protection Ltd.—in respect of the powder under the trade name "Cymag";

Metallurgical Chemists, Ltd.—in respect of the powder under the trade name "Cyanolime";

Bugge's Insecticides, Ltd.—in respect of the powder under the trade name "Gasit".

DDT and Human Food[2]

One of the most intriguing examples of the use of radio-isotopes in research has come from the Government's Pest Infestation Laboratory. Briefly, its object was to follow the fate of DDT residues upon wheat grains after the grain had been consumed as food. First, of course, it was necessary to prepare a sample of DDT in which one of the elements in the molecule was radioactive. The subsequent movements of the DDT residues upon grain could then be followed in animal bodies by locating and measuring the emitted radiations. It was found necessary to make a practical compromise and to use a chemical homologue of DDT instead of DDT itself. DDT has a molecule containing four chlorine atoms, one of which occupies a particularly stable position. Bromine, a sister element to chlorine, has a much more suitable radio isotope for use in this type of research. The actual insecticide used, therefore, was identical with DDT except that the stable chlorine atom was replaced by radioactive bromine. This should not be considered to reduce the value of the results since other and earlier work has shown that this bromine analogue of DDT is closely similar to DDT in all its properties including its toxicity.

Wheat was sprayed with the radioactive insecticide. Some was then milled and baked into bread. Both the wheat and the bread were fed to hens and rabbits. In one of the series of experiments a research worker consumed 30 grams of the bread. Although only minute amounts of the insecticide were involved—for example, the

[1]Extract from "Agriculture" (Journal of Ministry of Agriculture, U.K.), LVII, (10), 1951.

[2]Extract from paragraph No. 147, Science News letter No. 9, dated 13-1-51, Issued by the Indian Scientific Liaison Officer, U. K.

bread contained only 11.2 parts per million—it was possible to follow the quantitative movements of these trace amounts by measuring the radiations emitted. In the hen and rabbit feeding tests, considerably detailed investigations were possible by killing the animals after five days and measuring the radiation from dissected organs and tissues.

Residues of the insecticide were found in all tissues examined thus proving that substances of the DDT class are (1) not quickly eliminated from animal bodies and (2) are widely distributed throughout the body soon after consumption. In hens fed with the grain, residues were found in the gizzard, liver, kidney, sciatic nerve fibre, heart and brain tissues; in rats fed with the bread, residues were found in the sciatic nerve fibre, brain and liver. In the single human test only 5 per cent of the total activity in the bread consumed was eliminated in urine during the first 48 hours after ingestion.

The piece of research emphasises the toxic dangers of DDT residues upon foodstuffs, dangers, which have increasingly worried thoughtful scientists in recent years. The powerful tendency for DDT traces to be retained in the body rather than to be swiftly eliminated has been neatly established. The widespread use of DDT to protect edible crops and stored grain would give rise to serious risks of cumulative toxic effects upon human of animal consumers of the food. It is perhaps no coincidence that soon after the publication of this research, farmers and flourmillers were warned not to treat wheat with DDT.

Fungicidal action of Disodium ethylene bisdithiocarbamate[1].

Disodium ethylene bisdithiocarbamate (DSE), first synthesized in 1935, gave a rather erratic performance as a fungicide in the field, until Heuberger and Manns found that its performance could be improved by the addition of zinc sulphate and lime. Raymond W. Barratt ad James G. Horsfall (Conn. Agric. Exp. Sta. Bull. 508: pp. 51, New Haven, U.S.A. ; June 1947) conducted a laboratory investigation into the efficiency and mode of action of thirty-six analogues and homologues of the compound, using spores of the fungus *Stemphylium sarcinaeforme* for the tests. It was concluded, in general, that dithiocarbamate analogues inhibit spores through two reactions : by liberating sulphuretted hydrogen, and by forming metal salts of the compound. Fungicidal potency seemed to be independent of the number of sulphur atoms in the polysulphide linkage. It was found that the addition of zinc sulphate and lime greatly increased the stability of disodium ethylene bisdithiocarbamate through the production of zinc ethylene bisdithiocarbamate and this substance is now brought forward as the real fungicide.

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[1]Extract from Nature, (4234), 1951 : 1058.

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